## Bioterror PIC

### 1NC CP

#### Public colleges and universities ought not restrict constitutionally protected speech with the exception of synthetic biology research. Public colleges and universities ought to prohibit the publication of research aimed at enhancing the deadliness of pathogens.

#### Synthetic biology *at colleges specifically* is risky – releasing blueprints for crafting new diseases leads to extinction

Myhrvold 13 [Nathan, PhD in Theoretical and Mathematical Physics from Princeton, and founded Intellectual Ventures after retiring as Chief Strategist and Chief Technology Officer of Microsoft Corporation, July, "Stratgic Terrorism: A Call to Action," http://www.lawfareblog.com/wp-content/uploads/2013/07/Strategic-Terrorism-Myhrvold-7-3-2013.pdf]

A virus genetically engineered to infect its host quickly, to generate symptoms slowly—say, only after weeks or months—and to spread easily through the air or by casual contact would be vastly more devastating than HIV. It could silently penetrate the population to unleash its deadly effects suddenly. This type of epidemic would be almost impossible to combat because most of the infections would occur before the epidemic became obvious. A technologically sophisticated terrorist group could develop such a virus and kill a large part of humanity with it. Indeed, terrorists may not have to develop it themselves: some scientist may do so first and publish the details. Given the rate at which biologists are making discoveries about viruses and the immune system, at some point in the near future, someone may create artificial pathogens that could drive the human race to extinction. Indeed, a detailed species-elimination plan of this nature was openly proposed in a scientific journal. The ostensible purpose of that particular research was to suggest a way to extirpate the malaria mosquito, but similar techniques could be directed toward humans.16 When I’ve talked to molecular biologists about this method, they are quick to point out that it is slow and easily detectable and could be fought with biotech remedies. If you challenge them to come up with improvements to the suggested attack plan, however, they have plenty of ideas. Modern biotechnology will soon be capable, if it is not already, of bringing about the demise of the human race— or at least of killing a sufficient number of people to end high-tech civilization and set humanity back 1,000 years or more. That terrorist groups could achieve this level of technological sophistication may seem far-fetched, but keep in mind that it takes only a handful of individuals to accomplish these tasks. Never has lethal power of this potency been accessible to so few, so easily. Even more dramatically than nuclear proliferation, modern biological science has frighteningly undermined the correlation between the lethality of a weapon and its cost, a fundamentally stabilizing mechanism throughout history. Access to extremely lethal agents—lethal enough to exterminate Homo sapiens—will be available to anybody with a solid background in biology, terrorists included. The 9/11 attacks involved at least four pilots, each of whom had sufficient education to enroll in flight schools and complete several years of training. Bin laden had a degree in civil engineering. Mohammed Atta attended a German university, where he earned a master’s degree in urban planning—not a field he likely chose for its relevance to terrorism. A future set of terrorists could just as easily be students of molecular biology who enter their studies innocently enough but later put their skills to homicidal use. Hundreds of universities in Europe and Asia have curricula sufficient to train people in the skills necessary to make a sophisticated biological weapon, and hundreds more in the United States accept students from all over the world. Thus it seems likely that sometime in the near future a small band of terrorists, or even a single misanthropic individual, will overcome our best defenses and do something truly terrible, such as fashion a bioweapon that could kill millions or even billions of people. Indeed, the creation of such weapons within the next 20 years seems to be a virtual certainty. The repercussions of their use are hard to estimate. One approach is to look at how the scale of destruction they may cause compares with that of other calamities that the human race has faced.

#### Specifically, research into deadly disease is dangerous and should be banned – accidents or terrorists could release contagious pathogens

Horgan 12 [John Horgan, "Let's Ban Research That Makes the Bird-Flu Virus and Other Pathogens Deadlier," Scientific American, 2/6/2012] AZ

D: Ban all research, open or classified, aimed at making pathogens deadlier. This is my "least-bad" choice, because I believe that the risks of research like the recent H5N1 experiments outweigh potential benefits. In general, I favor unrestricted research and communication, just as I favor free speech. But if scientists keep introducing more lethal pathogens into the world, the odds grow that one of them will be unleashed intentionally or accidentally. Moreover, if the U.S. keeps pursuing research into new strains of infectious disease, other nations and groups are more likely to do so as well. My fears stem in part from the history of biological-warfare research, as detailed in accounts such as A Higher Form of Killing: The Secret History of Chemical and Biological Warfare, by Robert Harris and Jeremy Paxman (Random House, 2002). Such research, which has been carried out at least since World War II by the U.S., United Kingdom, Soviet Union, Japan and other states, has repeatedly led to releases of pathogens. In 1979, biological-warfare experiments in a Soviet facility in Sverdlovsk triggered an anthrax epidemic that killed 70 people.

#### College youth are uniquely vulnerable to radicalization

Fox Boston 15 ["Islamic State recruiting older teens, college students," 8/29/2015] AZ

College students are heading back to the dorms and lecture halls. They are adjusting to life away from home and finding a new identity for themselves. While it may seem far-fetched, for some that makes them the perfect target for something sinister and it's happening more than you think. FOX25 investigates the way ISIS is recruiting on campus. A MOTHER'S PLEA Nineteen year old Mohammed Hamzah Khan is accused of trying to support ISIS and is facing serious terror charges. His mother, Zarine, has a public plea to the terror group to stop recruiting children: "Without the internet, without social media this would never had happened and my son would not be in this situation he is in today. Leave our children alone. Please. That's my only message. Just stop recruiting these children. They're too young they don't know what's going on . They're vulnerable. Their thinking skills have not completely developed and these people are preying on that" ISIS RECRUITMENT TACTICS AND SOCIAL MEDIA ISIS is changing it's recruitment tactics. Experts say propaganda videos are less bloody and produced professionally. Social media is a high priority and they're taking online communication to the next level to catch the eye of college students. The number of websites, forums, Twitter accounts, Facebook pages that belong to ISIS and other similar organizations have increased . Professor Dana Janbek of Lasell College studies global terrorism and new media. She says the online magazine ISIS publishes is an example of how the terror group is trying to get their message across by seeming more legitimate in an attempt at luring young people with higher skill sets. Janbek says the magazine includes current events, making it relevant and it is professionally written. ISIS RECRUITING COLLEGE STUDENTS Professor Dana Janbek tells FOX25 that even though ISIS is viewed as a extremist terror organization, they see themselves as a legitimate government and they are aiming high when recruiting college students. They rely on people with different backgrounds and different skill sets including students and professionals who have a medical backgrounds.

#### Studies prove

Greer 14 [Scott Greer (deputy editor), "Study: Spoiled, wealthy college students more likely to support terrorism," Daily Caller, http://dailycaller.com/2014/03/20/study-spoiled-wealthy-college-students-more-likely-to-support-terrorism/#ixzz4VsjULps]

According to the study conducted by Queen Mary University in London found that youth, wealth and a full-time education are significant risk factors for violent radicalization. The researchers worked from the belief that radicalization is a process and focused on the factors that define the pre-radicalization phase and make individuals susceptible to the messaging of extremist groups in their study.

#### Research on infectious disease specifically is protected

Ram 17 [Natalie Ram (Assistant Professor, University of Baltimore School of Law), "Science as Speech," Iowa Law Review, 2017] AZ

When the U.S. government institutes a “pause” on certain virology studies or requests that prominent scientific journals not publish the results of others, it inserts itself into the process of producing and disseminating knowledge.256 The relationship between government intervention and knowledge production cannot be clearer than when the government justifies its actions by citing “significant concerns that the information . . . could be misused to endanger public health and national security.”257 It is here that the modified O’Brien analysis guards against enticing, but flawed, efforts to regulate scientific experimentation. Moreover, that analysis can help refocus regulatory efforts in more productive and constitutionally sound ways. To be sure, the government’s conduct with respect to infectious-disease research has, thus far, been limited to federal funding decisions and requests for voluntary action. Such conduct is likely constitutional for reasons unrelated to the knowledge-production analysis discussed here.258 But should the government move from these more limited methods to broader, coercive prohibition, the modified O’Brien analysis would have a role to play in separating constitutionally valid rationales for regulating research from constitutionally invalid ones. With respect to the first O’Brien requirement, both federal and state governments likely have sufficient constitutional authority to act in this domain, just as they do in regulating gene-editing technology and human cloning.259 As in these other spheres, the government is likely to have acted pursuant to “an important or substantial” government interest, thus satisfying the second prong of O’Brien.260 Where the government has acted to prevent researchers from completing or publishing infectious-disease research, it has done so in the name of “public health and national security.”261 Each of these interests exceeds the “important and substantial” baseline. The Supreme Court has remarked, “[e]veryone agrees that the Government’s interest in combating terrorism is an urgent objective of the highest order.”262 Similarly, the Court has observed that “[i]t is a traditional exercise of the States’ ‘police powers to protect the health and safety of their citizens,’” and concluded that this interest may be sufficiently weighty to justify a restriction on speech.263 Yet, prohibiting infectious-disease research, where it is driven by the specter of how the results of such research might be misused, founders on the third prong of the modified O’Brien analysis. The express purpose of such a prohibition—whether phrased as a “pause” or an outright ban—is to prevent people from discovering certain knowledge for fear of its misuse. That goal, in turn, is directly related to the suppression of knowledge production. This is precisely what the modified O’Brien test is designed to guard against.264 Prohibiting certain infectious-disease research is also unlikely to satisfy O’Brien’s final requirement, that the “restriction on alleged First Amendment freedoms is no greater than is essential to the furtherance of that interest.”265 In most instances, efforts to prohibit scientific publication have been rendered moot by similar research conducted outside the United States or by the scope of other publicly available information. Consider the H5N1 research the U.S. government sought initially to censor: the publications at issue stemmed from research conducted in the United States and in the Netherlands.266 Even had the government suppressed or prohibited research conducted within its borders, its efforts would have been undermined by comparable research taking place elsewhere.

### Synth Bio = Academic Freedom

#### It's protected by academic freedom

Samuel 8 [Gabrielle N Samuel, Michael J Selgelid, and Ian Kerridge, "Managing the unimaginable. Regulatory responses to the challenges posed by synthetic biology and synthetic genomics," 2008] AZ

Although there is broad public and professional support for scientific research, it is also generally accepted that research should operate within acceptable social norms and should not unreasonably threaten public safety or impose unacceptable social burdens. The challenge for regulators in relation to synthetic life science is to devise a legislative and regulatory system that balances security and safety risks to facilitate research without imposing unreasonable bureaucratic burdens on scientists and academic freedom.

### Synth Bio = Terror

#### Information used by terrorists to create bioweapons

NRC 4 [National Research Council (US) Committee on Research Standards and Practices to Prevent the Destructive Application of Biotechnology, "Information Restriction and Control Regimes," 2004] AZ

Until recently, there were very few cases of problems related to the publication of research results in the life sciences that attracted significant public attention. Some specialists in bioterrorism, however, had warned that, given continuing advances in biotechnology, open publication could provide information of use to terrorists.43 The publication of the “mousepox” study, as well as other studies discussed in Chapter 1, made the issue a major concern for journal editors.44 The public perception of potential risks associated with publication of such information led to calls for scientific journals to refrain from publishing “dangerous” research or to delete some data from published research results in order to preclude others from replicating the results.45 Journals in the life sciences have responded in a number of ways to the concerns that published articles might provide useful knowledge or a road map for terrorists or rogue states.

#### Synthetic biology means risk of bioterror is high—widespread information and DNA building blocks

Oswald 10 [Rachel Oswald (Global Security Newswire), “Synthetic Pathogens Might Pose Bioterror Threat, Scientists Warn,” Nuclear Threat Initiative, 9/10/2010] AZ

**The newfound ability of scientists to produce disease materials from scratch has led to concerns that extremists might seek the same capabilities to carry out** acts of **bioterrorism** (see [GSN](http://www.nti.org/gsn/article/scientific-advances-could-lower-bar-for-biological-attack/), Aug. 11). **Synthetic pathogens are man-made infectious agents that are produced either from the manufacture or adaptation of DNA, cells and other biological structures**. While scientists have been engineering genetic sequences for decades and commercial gene sequencing has been around for years, the field continues to move into uncharted territory. This year, **researchers for the first time were able to design and produce cells that do not exist in nature without using pre-existing biological matter** -- marking the latest evolution in the rapidly advancing field of synthetic biology. Additionally, **recent technological advances and lower equipment costs now allow amateur scientists to conduct complex biological experiments such as DNA duplication outside of institutional settings and with machinery purchased online.** The developments could pave the way for advancements in medicine, energy and agriculture, but also could put sensitive materials in the wrong hands, analysts warn (see [GSN](http://www.nti.org/gsn/article/synthetic-genome-raises-biosecurity-concerns/), May 21). "With the advent of DNA synthesis technology, **simply** restricting access **to the actual pathogen** no longer provides **the** securitythat it once did. Since the gene sequence is a blueprint, **once an organism has been sequenced it can be synthesized without using samples of existing cultures or stock DNA,"** issue specialists Ethel Machi and Jena Baker McNeill wrote for the Heritage Foundation in an [August memo](http://www.heritage.org/research/reports/2010/08/new-technologies-future-weapons-gene-sequencing-and-synthetic-biology) on the issue. **The federal government classifies 82 pathogens and biological toxins such as anthrax and smallpox as "select agents" that pose an extreme threat to public health.** Access to those materials is strictly regulated. However, the complete **genetic sequences**, known as the genome, for many of these select agents **are now available** through the Internet**. "**The problem is that now you can make DNA. For a number of these, you really don’t need to have access to the sample. **The genome of these pathogens are in publicly available databases**," said Jean Peccoud, an associate professor at the Virginia Bioinformatics Institute at Virginia Tech. "For a few thousand dollars you can get the Ebola genome." The genetic sequence is not harmful in itself. It must be inserted into a recipient cell and begin replicating to pose a physical threat. "I could have the entire genome of the Ebola virus and eat it with my breakfast," said Gigi Kwik Gronvall, a senior associate with the University of Pittsburgh's Center for Biosecurity. "In order to have a pathogen, the sequence needs to be processed by a cell." A scenario presently exists in which terrorists could place an Internet order for the DNA sequence of a select agent and then use the sequence and synthetic biology techniques to recreate or even genetically modify the pathogen in a laboratory. The likelihood of success in this area, however, is considered very small for anyone working without at least a graduate level of education in the field and years of practice synthesizing sequences, according to a September 2009 University of California, Berkeley [working paper](http://gspp.berkeley.edu/iths/Maurer_IASB_Screening.pdf) on biosecurity concerns by synthetic genomic industry experts. Still, multiple scientists and security experts interviewed for this article by Global Security Newswire declined to describe in detail the bioterrorism possibilities of synthetic biology for fear of giving extremists insights on how to create or adapt lethal disease agents. "**There has not been an incident yet but the technology is very cheap. I think there is definitely a risk. The question is trying to figure out where is the risk,**" Peccoud said. Under the auspices of researching and combating infectious agents**, scientists in 2008 used synthetic biology to recreate the SARS virus. Three years earlier, researchers successfully reconstructed the 1918 flu virus, which caused a worldwide pandemic estimated to have killed 50 million people.** "Eventually, **it will** almost certainly **be possible to recreate bacterial pathogens like smallpox. We might also be able to enhance these pathogens.** Some work in Australia on mousepox suggests ways of making smallpox more potent, for example. **In theory,** entirely new pathogens could be created," Hastings Center Report Editor Gregory Kaebnick said in [congressional testimony](http://energycommerce.house.gov/documents/20100527/Kaebnick.Testimony.05.27.2010.pdf) during a May hearing on Capitol Hill. At a 2003 closed seminar hosted by the National Academy of Sciences, scientists discussed the possibility that new "designer" biological weapons could be engineered**. Possibilities include genetically modifying two innocuous agents to become lethal when combined or engineering viruses to cause low-level symptoms that become deadly when the infected person takes a common treatment such as aspirin** (see [GSN](http://www.nti.org/gsn/article/us-scientists-warn-cia-of-new-designer-biological-agents/), Nov. 17, 2003).

### Colleges Key

#### Students learn synthetic biology and the skills needed to build dangerous bio-weapons at colleges – that's Mhyrvold.

#### Even if other firms also do a lot of research in synthetic bio, colleges are uniquely vulnerable to dangerous use – students are easily radicalized – that's Greer.

#### Public colleges like the UC system are hotspots for synth bio research

Krieger 13 [Lisa Krieger (science writer), "Synthetic biology: Stanford, UC Berkeley engineering a new frontier," Mercury News, 2/15/2013] AZ

“I dream we could someday reprogram trees that could self-assemble a computer chip in your front yard,” exudes the brilliant and intense Stanford University bioengineer, who has emerged as a leading evangelist in the new field of synthetic biology.

One gene at a time, Endy and other elite teams of Bay Area scientists are striving to design and build organisms unlike anything made by Mother Nature. It’s not yet possible to create artificial life from scratch. But it’s getting closer, through projects that essentially swap out a cell’s original operating system for a lab-designed one. These made-to-order creations then can be put to work. The Human Genome Project gave us the ability to read nature’s instruction manual — DNA — like words in a book. But the real opportunities, scientists say, lie in our ability to not only read genetic code, but to write it, then build it using off-the-shelf chemical ingredients, strung together like holiday lights. It is the creation of new genomes — and a new frontier in bioengineering. Synthetic biology works because biological creatures are, in essence, programmable manufacturing systems. The DNA instruction manual buried inside every cell — its software, in a sense — can be replaced with a man-made version, giving us the ability to tell it what to make. This presages the distant day when Endy’s big Menlo Park cedar churns out computer chips, not cones. Or makes cancer-fighting drugs. Or fuels. Or building materials. Or anything else. There are concerns about safety and ethics. In the wrong hands, lone villains or rogue regimes could unleash dangerous life forms. A review in 2010 by a White House commission concluded the field needs monitoring, but the risks are still limited. Synthetic biology is different from genetic engineering, which simply inserts a gene from one organism into another. “Syn biologists” are engineers who construct whole new genomes — using made-to-order parts from foundries, or “fabs,” much as industry orders up cast and machined metal parts. UC-Berkeley researcher Chris Anderson is building tumor-killing bacteria. In Emeryville, Amyris Biotechnologies adds genes to yeast or bacteria to make novel biofuels. The company LS9 of San Carlos is engineering bacteria that can make hydrocarbons for gasoline, diesel and jet fuel. They might use naturally existing genes, but they apply them for a new purpose. They might redesign them. Or they might design genes from scratch, like Legos. Frustrated by the lengthy, ad hoc and trial-and-error progress of current “bio-manufacturing” techniques, the National Science Foundation (NSF) and the Pentagon are funding foundries to produce the stuff of life. A $1.4 million NSF grant established the Emeryville-based BIOFAB lab, led by UC Berkeley and Stanford engineers. It is expected to produce thousands of free standardized DNA parts — and the publicly available codes needed to assemble them. These BIOFAB parts are essential to the ambitions of the Synthetic Biology Engineering Research Center, or SynBERC, a prominent coalition of biology research labs supported by $23 million of NSF funding. Its goal is to make biology easier engineer. It includes University of California campuses at Santa Cruz, Berkeley and San Francisco, as well as private biotech companies and venture capital firms.

#### Universities are training grounds for synthetic bio

Philp 15 [Jim Philp, "Training for synthetic biology jobs in the new bioeconomy," Science Magazine, 6/2/2015] AZ

Formal education in synthetic biology is still a pioneering field, but the number of dedicated or related university courses has grown fast these past few years, with at least 100 institutions now involved.

Currently, the most common training programs lead to research master’s degrees. In Europe, the Center for Research and Interdisciplinarity (CRI), for example, offers a 2-year Interdisciplinary Approaches in Life Sciences master’s program with a specific track in systems and synthetic biology. Students in this program study statistics, biophysics, and computational approaches while also training in scientific communication and the ethics of bioengineering. The course is open to students with a wide range of backgrounds, including mathematics, physics, computer sciences, chemistry, biology, medicine, philosophy, and sociology. Non-biologists who wish to learn about life sciences may also be accepted for a Ph.D. or postdoc. The 1-year MRes program in systems and synthetic biology at Imperial College London offers a stronger research focus, supporting students in the life sciences, engineering, and physical sciences for collaborative work. Newcastle University runs a 1-year M.Sc. program in synthetic biology for students with biological, computational, mathematical, or engineering backgrounds. The program, which is based in the School of Computing Science, focuses on computing and engineering skills for the programming of biological systems. Opportunities also exist at the Ph.D. level. In the United Kingdom, for example, the University of Oxford, the University of Bristol, and the University of Warwick jointly run the EPSRC and BBSRC Centre for Doctoral Training in Synthetic Biology, which is a 4-year program open to students from a broad range of fields, including engineering, biochemistry, plant sciences, physics, chemistry, mathematics, and computing. In the United States, scientists and engineers at the undergraduate, graduate, and postdoctoral levels are offered a range of educational opportunities at the University of California campuses in Berkeley and San Francisco, Stanford University, Harvard University, the Massachusetts Institute of Technology, and the California Institute for Quantitative Biosciences; all these institutions have partnered with the National Science Foundation to create the Synthetic Biology Engineering Research Center. Rice University offers a Ph.D. program that combines systems, synthetic, and physical biology to students with backgrounds in biology, chemistry, computer science, engineering, mathematics, statistics, or physics. Northwestern University offers a cluster program in biotechnology and systems and synthetic biology to Ph.D. students with a scientific or engineering background.

### A2 Research Already Published

### A2 Private Colleges

#### Public colleges like the UC system are hotspots for synth bio research

Krieger 13 [Lisa Krieger (science writer), "Synthetic biology: Stanford, UC Berkeley engineering a new frontier," Mercury News, 2/15/2013] AZ

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### A2 Synth Bio Not Protected

#### Infectious disease research is protected by the First Amendment – that's Ram.

#### Bio-engineering research is protected by free speech doctrine

Koebler 15 [Jason Koebler (staff writer), "Genetic Engineering Is (Probably) Protected By the First Amendment," Motherboard, 9/14/2015] AZ

The dawn of cheap genome editing techniques such as CRISPR understandably have people across the political spectrum worried about what a future of designer babies, more pathogenic viruses, deextincted species, clones, and glow-in-the-dark sushi might look like. But does putting limits on genetic engineering violate scientists' constitutional rights? The First Amendment has been interpreted by the Supreme Court to encompass not just the freedom of speech, but also the freedom of expression and expressive conduct, which likely includes acts of science, according to Alta Charo, a bioethicist and law professor at University of Wisconsin Law School. "We understand that religious conduct can be protected," Charo said last week at a DARPA conference in St. Louis. "When I fertilize an egg in a laboratory, am I conveying a message about the lack of need of a deity? In other words, am I expressing something that is in a fundamental way political?" Many scientists would likely argue that, yes, science is political, perhaps even religious speech. When geneticist Craig Venter created synthetic life using manmade DNA bases back in 2010, it was heralded (and denounced) as an act of a scientist "playing God." Some called it proof that intelligent design is real. Venter himself called it an "important step both scientifically and philosophically" and said it "changed [his] views of definitions of life and how life works." Writing in the New Yorker last week, theoretical physicist Lawrence Krauss wrote that "all scientists should be militant atheists." "The notion that some idea or concept is beyond question or attack is anathema to the entire scientific undertaking," he wrote. "Five hundred years of science have liberated humanity from the shackles of enforced ignorance. We should celebrate this openly and enthusiastically, regardless of whom it may offend." History is filled with scientists who were trying not only to make new discoveries but were attempting to prove that natural laws can be used to explain what was previously given religious or supernatural provenance. Through their lenses, it's not hard to see the act of performing science as political speech. And, if that's the case, shouldn't it be protected under the First Amendment, regardless of whether or not the populous finds the idea of, say, designer babies morally reprehensible? Or, what if we just find a new branch of science a little bit weird? New technologies have made it possible to edit genomes in your kitchen—if people begin creating glow-in-the-dark rabbits, should we stop them? Or are they now artists creating protected speech?

#### Academic freedom is free speech

Roig 16 [Jorge R. Roig (Assistant Professor of Law, Charleston School of Law, Charleston, South Carolina; Juris Doctor, University of California at Berkeley, Boalt Hall School of Law, 2000; Bachelor of Arts with Honors in Economics, Harvard University, 1997), "Can DNA Be Speech?" Cardozo Arts & Entertainment Law Journal, 2016] AZ

However, there is plenty of Supreme Court precedent extending robust First Amendment protection to academic discourse. “Our Nation is deeply committed to safeguarding academic freedom, which is of transcendent value to all of us, and not merely to the teachers concerned. That freedom is therefore a special concern of the First Amendment, which does not tolerate laws that cast a pall of orthodoxy over the classroom.”207 “[T]he First Amendment protects scientific expression and debate just as it protects political and artistic expression.”208 This is why “scientific seminars, discussions, and publications are covered by the First Amendment.”209 “Authors routinely write books and articles in which they communicate procedures to each other. . . . [S]uch writings are unambiguously covered by the First Amendment.”210

#### DNA manipulation is protected by free speech doctrine – outweighs

#### DNA as a molecule already carries messages

Roig 16 [Jorge R. Roig (Assistant Professor of Law, Charleston School of Law, Charleston, South Carolina; Juris Doctor, University of California at Berkeley, Boalt Hall School of Law, 2000; Bachelor of Arts with Honors in Economics, Harvard University, 1997), "Can DNA Be Speech?" Cardozo Arts & Entertainment Law Journal, 2016] AZ

The first category of activities is the simplest one. In these, DNA is the message itself. There are several ways in which the messages encoded in the DNA chain of base pairs can convey important messages about themselves. First off, is the ability of geneticists to communicate with one another regarding their work in genetics by being able to share with each other the DNA strands that they are working on. In this context, the experience with other specialized languages, such as computer code, music, and mathematical or chemical formulae, is illuminating. In Universal City Studios, Inc. v. Corley, the Second Circuit Court of Appeals determined that computer code is recognizable as speech under the meaning of the First Amendment and drew comparisons to other encoded communications, such as music or mathematical equations.193 “Communication does not lose constitutional protection as ‘speech’ simply because it is expressed in the language of computer code. Mathematical formulae and musical scores are written in ‘code,’ i.e. symbolic notations not comprehensible to the uninitiated, and yet both are covered by the First Amendment.”194 “Even dry information, devoid of advocacy, political relevance, or artistic expression, has been accorded First Amendment protection.”195 “[P]rogrammers communicating ideas to one another almost inevitably communicate in code, just as musicians use notes. Limiting First Amendment protection of programmers to descriptions of computer code (but not the code itself) would impede discourse among computer scholars, just as limiting protection for musicians to descriptions of musical scores (but not sequences of notes) would impede their exchange of ideas and expression.”196 The Sixth Circuit Court of Appeals similarly recognized the importance of guaranteeing the ability of both scientists and artists to communicate their ideas to each other in another case dealing with computer source code.197 “The Supreme Court has explained that ‘all ideas having even the slightest redeeming social importance,’ including those concerning ‘the advancement of truth, science, morality, and arts’ have the full protection of the First Amendment.”198 A specific example of how scientists are currently using DNA to establish standards and communicate scientific facts and ideas to each other is DNA Barcoding. 199 Through this process, DNA sequences are “read” by scientists to determine the taxonomy of an unidentified species.200 In this way, a reliable bank of information concerning all identifies species can be centralized and understood by all scientists around the world, who can then use the information gathered and stored in that bank to aid in their own research. Hence, using DNA as the language for this databank of genetic barcodes furthers the First Amendment value of truth.

#### DNA functions as a coded medium for transmitting and storing information

Roig 16 [Jorge R. Roig (Assistant Professor of Law, Charleston School of Law, Charleston, South Carolina; Juris Doctor, University of California at Berkeley, Boalt Hall School of Law, 2000; Bachelor of Arts with Honors in Economics, Harvard University, 1997), "Can DNA Be Speech?" Cardozo Arts & Entertainment Law Journal, 2016] AZ

Another way in which humans are using DNA’s informational capabilities is by using its coding language and system to store all kinds of information that has nothing to do with genetics or biology at all. The ability to do so has a lot to do with the striking similarities between DNA code and computer code. In the context of proposing that copyright protection be extended to engineered DNA sequences, Holman provides a detailed explanation of how genetic code and computer code are similar, and how they can easily be translated one to the other: Returning to DNA, the analogy between software code and genetic code is striking. A genetic sequence provides a series of instructions directing a living cell to perform functions dictated by the instructions. Genetic engineering permits a human to dictate these instructions. Like a computer program, a genetic sequence can be expressed in a format directly interpretable by a human, albeit instead of a series of zeros and ones, it is a sequence of A, T, C and G's, representing the four primary nucleotides that make up DNA. Genetic sequences can also be represented at various levels of abstraction. A three nucleotide codon representing an amino acid can be symbolized by a single letter representing that amino acid. A string of codons representing a protein domain can be expressed as a single symbol representing the domain, and a combination of domains can be expressed as a single protein. A string of nucleotides constituting a regulatory element, such as a promoter or enhancer, can be represented by a single symbol. For a good example of an engineered genetic sequence represented at a very high level of abstraction, see the figure used by Venter and colleagues to represent the full-length sequence of the synthetic bacterial genome they created. By means of abstraction, they are able to represent a genetic sequence comprising 582,970 nucleotides essentially as a notated circle. A recent article describes the importance of being able to represent genetic sequences at a high level of abstraction in order to facilitate the design of complex synthetic DNA molecules. Like software, in order to be useful, engineered genetic sequences must be transcribed into a format that can be interpreted by the primary intended audience, the difference being the audience in this case is a cell rather than a computer. In either case, this involves physically transcribing instructions into the appropriate medium of communication at a “nano” level. In the case of a CD-ROM, the reflective properties of a thin layer of aluminum are altered by making microscopic indentations, while in DNA the ordering of molecular subunits (individual nucleotides) conveys the message to the appropriate audience.273 One of the first examples of how DNA can be used as code to store and communicate information is the work of Dr. George Church who, with the help of his colleague, Sriram Kosuri, both from Harvard University, translated his most recent book on genomic engineering, 274 in its entirety, into DNA code, printed it out on an actual strand of DNA, and then read it back from the DNA strand. 275 By converting text to digital form, and then substituting the resulting ones and zeroes by DNA base pairs, any book or document can be stored in DNA. In fact, any file that is converted to digital format can be stored in the same way. Dr. Church explains that the resulting DNA strand can be a viscous liquid or a solid salt.276 The encoded DNA is extremely resilient, easy to store, and can last for extremely long periods of time. Such storage is also cheap, and growing ever cheaper. “Already, the production costs . . . have dropped from $10,000 per million base pairs of DNA in 2001 to about 10 cents per million base pairs in 2012, according to the National Human Genome Institute.”277 Furthermore, huge amounts of information can be stored in DNA. It is estimated that “[a] mere milligram of the molecule could encode the complete text of every book in the Library of Congress and have plenty of room to spare.” 278 A second team of scientists, this time in the United Kingdom, has made a translation into DNA of Shakespeare’s sonnets, Dr. Martin Luther King, Jr.’s “I Have a Dream” speech, a photograph of their laboratory, sound files, and an early article by Dr. James Watson and Dr. Francis Crick about DNA. 279 Nick Goldman and Ewan Birney of the European Bioinformatics Institute at the European Molecular Biology Laboratory were able to encoded all these text, sound and image files, and successfully retrieve them with 100% accuracy. 280 As described above, they first translated the information into binary form and then coded into DNA. 281 Thereby, they facilitated the error-free recovery of information. 282 They note that two of the important advantages to storing information this way is the remarkable ability of DNA to curl itself up using a natural method of compression that makes it extremely small and effective at storing huge amounts of information in very little space.283 Storing digital data by conventional methods doesn’t exactly take up a lot of space these days. One can get a pocket-sized hard drive that stores a terabyte of information, equal to hold about 2,000 hours of music. But storing information on DNA means cramming 2,000 times as much data onto a sugar cube-sized device.284 Additionally, as mentioned before, this form of data storage is remarkably resilient and can last for tens of thousands of years. 285 Susan Alexjandre, on the other hand, instead of translating and storing her music in DNA, has been translating DNA into music. 286 She uses spectrograph frequencies of DNA, converts those wavelengths into hertz, and then brings the resulting frequency down to a level where human ears can hear it.287 The result is the “sound” of DNA.288 “Most of the molecular data comes from spectrographs that I collect in science libraries,” she says.289 “Spectrographs list frequencies from almost anything on the atomic level such as DNA, water, hydrogen and oxygen, etc.”290 This type of artistic expression furthers both the values of truth and autonomy in ways that could hardly be said to compromise the integrity of our community. Hence, it serves to further support the case for First Amendment coverage of DNA. Willem “Pim” Stemmer, the scientist who invented “DNA shuffling”, made another interesting proposal along these lines in 2002. 291 “To circumvent what he perceived to be a prohibition against direct copyright protection for engineered DNA, he outlined a proposal whereby a DNA sequence is converted into music, and then copyrighted as a musical work.” 292 His mental exercise was meant to illustrate the similarities between traditional art forms, such as music, and DNA sequences created by human beings. The logic of his point, made for the purposes of copyright law, is equally valid in terms of applying the Free Speech Clause. If a musical score and an original DNA sequence are so similar in nature that the messages contained in them can be expressed alternatively in the other, why should the law treat them any differently? If a piece of music is “speech” for First Amendment purposes, so should an original strand of DNA. In Universal City Studios, Inc. v. Corley, the Second Circuit Court of Appeals determined that computer code is recognizable as speech under the meaning of the First Amendment and drew comparisons to other encoded communications, such as music or mathematical equations.293 “Communication does not lose constitutional protection as ‘speech’ simply because it is expressed in the language of computer code. Mathematical formulae and musical scores are written in ‘code,’ i.e. symbolic notations not comprehensible to the uninitiated, and yet both are covered by the First Amendment.”294 The same should be true for DNA when it is used as code. The use of DNA as code literally creates a new medium for the storage, replication, distribution and communication of ideas. This new medium is resilient, compact, efficient and accurate. Through its use, all of the values incarnated in the First Amendment protection of free speech, truth, democracy, autonomy and community, can be furthered, much in the same way that they are furthered by the printing press or the Internet. DNA is the brick and mortar of the Great Library of Alexandria of the future. A Great Library that could last much longer, and be much smaller, and could even have redundant backups all across the world, and even beyond. As such, the regulation of this new medium of communication must trigger First Amendment scrutiny.

#### DNA manipulation is a type of expression – it's protected

Roig 16 [Jorge R. Roig (Assistant Professor of Law, Charleston School of Law, Charleston, South Carolina; Juris Doctor, University of California at Berkeley, Boalt Hall School of Law, 2000; Bachelor of Arts with Honors in Economics, Harvard University, 1997), "Can DNA Be Speech?" Cardozo Arts & Entertainment Law Journal, 2016] AZ

Changes in DNA, then, can produce different phenotypes. And the creation of different phenotypes can serve to express artistic, political, or other types of messages. The techniques to do just that have been progressing recently at an amazing pace. Today, the ascent of synthetic biology is transforming genetic engineering in fundamental ways, enabling an entirely new level of control and precision. Synthetic biologists are increasingly able to design and synthesize genetic sequences that deviate substantially from anything occurring naturally and capable of performing novel and often highly useful functions. Techniques that rely upon naturally occurring DNA sequences as starting material, such as DNA shuffling and other modes of directed molecular evolution, have been successfully deployed to create synthetic gene sequences deviating substantially from anything found in nature. Work is progressing on methods for de novo genetic design, which results in genetic sequences bearing even less resemblance to any natural counterpart.297 This increase in the use of the expressive capacity of DNA through synthetic biology has led some commentators to argue that we are due to reconsider the applicability of copyright law to DNA, a question that was addressed in the 1980s but has since been mostly forgotten.298 An illuminating example of just such an expressive use of DNA is the artistic work of Eduardo Kac.299 Kac creates what he calls “Transgenic Bio Art.”300 One of his most celebrated creations is Alba, the GFP Bunny, who glows bright green under certain lights. 301 Alba was created by introducing a synthetic version of fluorescent genes from jellyfish into his genome. 302 Kac has also made works consisting of such interesting flights of fancy as the Edunia, “[t]he central work in the “Natural History of the Enigma” series.”303 The Edunia “is a plantimal, a new life form [Kac] created . . . , a genetically engineered flower that is a hybrid of [him]self and Petunia.” 304 “The Edunia expresses [Kac’s] DNA exclusively in its red veins.” 305 Along with Kac’s detailed explanations regarding the meaning and intent behind his works, these artistic creations are powerful statements regarding the nature of life itself and our place in the universe. These expressions further all the First Amendment values previously discussed, particularly the values of truth and autonomy. Consequently, their regulation should trigger First Amendment scrutiny. Another example of the alteration of genetic material to create animals with expressive phenotypes is the manufacture and sale of glow-in-the-dark fish.306 At almost any local pet store nowadays one can find for sale, colorfully advertised to attract children, fish that have been genetically altered to glow in different neon colors when placed near a black light.307 This purely commercial use of DNA does not seem to greatly further any of the First Amendment values discussed, but it does not appear to be particularly harmful to any of them either. However, there are also cases of fish being altered to have the color patterns on their scales actually display written messages.308 One could easily imagine how such technology could be used to make powerful artistic or even political messages. For example, at the present moment of writing this article, there is an ongoing active armed conflict between Israel and the territories inhabited by Palestinians. It would be an interesting exercise of political speech to alter the DNA of a flock of doves (the dove being an internationally and culturally recognized symbol for peace) so that their plumage spelled the word “peace” in different languages, and genetically program them to be attracted to, say, gunpowder, and release them in the Gaza Strip. Ethical concerns about the fate of the doves aside, it would surely make a striking statement worthy of First Amendment coverage.309 How about art imitating life? That is one of the themes behind the art of Heather Dewey-Hagborg. 310 This plastic artist collects items that people casually leave behind, like cigarette butts on a New York City street, and harvests from them traces of DNA.311 She then processes that DNA, and extrapolates from it computer models of what the people that left it behind might look like.312 Finally, she creates sculptures, photographs or other pictorial, graphic or sculptural representations of the individuals’ approximate likenesses.313 Again, this serves as an example of an artist making works that certainly further the values of truth and autonomy under the First Amendment. Scientists have created a program that transfers organic chemical structures with solar storage potential into lines of computer code. 314 The program then allows the user to remove parts of the code and splice it with other solar-capable molecules in order to create an “organic battery.”315 “The Curio Molecular Designer will allow you to help us design new materials. By following simple chemical rules and using our predictive model, you can help us develop new candidates for solar cell materials.”316 But this particular experiment is not the only one of its kind. For example, undergraduates and even high school students are now able to design genetic constructs by rearranging DNA modules in creative and often ingenious ways. The BioBricks Foundation is assembling a set of DNA modules, which it refers to as “standard biological parts,” for use in this sort of higher level genetic engineering.317 These examples show the immense potential for scientific cooperation and even crowdsourcing created by our ability to manipulate DNA sequences by interchangeably translating information from DNA to computer code and back. The First Amendment covered marketplace of ideas would surely benefit from such open interaction.

#### Research is protected

Ferguson 79 [James Ferguson (Law Clerk to Judge William J. Bauer, United States Court of Appeals for the Seventh Circuit. J.D. 1976, Northwestern), "Scientific Inquiry and the First Amendment," Cornell Law Review, 1979] AZ

Simply stated, the constitutional claim of scientific inquiry holds that the research enterprise of scientists has a first amendment importance because it is essential to the ability of individuals to engage in scientific expression. The argument thus proceeds on the assumption that scientific expression is itself protected by the free speech clause of the first amendment. This initial premise entails no sharp break from accepted first amendment principles; indeed the Supreme Court has strongly hinted on several occasions that scientific speech is a protected form of expression. 19

### A2 Speech/Conduct Distinction

#### No speech/conduct distinction

Ferguson 79 [James Ferguson (Law Clerk to Judge William J. Bauer, United States Court of Appeals for the Seventh Circuit. J.D. 1976, Northwestern), "Scientific Inquiry and the First Amendment," Cornell Law Review, 1979] AZ

The speech-conduct dichotomy does not always provide a useful analytical framework, however, for some forms of conduct are so tightly bound up with protected speech as to warrant a measure of constitutional protection themselves. 37 Indeed,, the Supreme Court has found at least three distinct patterns of activity to merit first amendment protection. First, the Court has long held that certain modes of communication-picketing, marching, distributing handbills-fall within the scope of the first amendment even though such activity is, to some extent, nonverbal conduct.38 Second, the Court has acknowledged that "symbolic acts" such as the wearing of armbands are "closely akin to 'pure speech"' and thus worthy of protection.39 Finally, the Court has recently recognized a third form of conduct with first amendment significance-what might be broadly described as noncommunicative conduct essential to the ability of individuals to engage in free expression. 40 This third category of first amendment activity bears closer examination, for herein lies the basis for the constitutional argument of scientific inquiry.41

### A2 Written Speech Not Protected

#### No distinction between written and spoken speech

Roig 16 [Jorge R. Roig (Assistant Professor of Law, Charleston School of Law, Charleston, South Carolina; Juris Doctor, University of California at Berkeley, Boalt Hall School of Law, 2000; Bachelor of Arts with Honors in Economics, Harvard University, 1997), "Can DNA Be Speech?" Cardozo Arts & Entertainment Law Journal, 2016] AZ

While the Court and most commentators have traditionally recognized a doctrinal distinction between “pure speech” and “expressive conduct,” 26 closer consideration reveals that both forms of expression are subject to the same analysis.27 Ultimately, whether a given activity is speech or not turns on whether, under the circumstances and within a given social context, a symbol, gesture, action, or representation has the potential to communicate a message. In the case of “pure speech”, the Court has made a per se determination that written and spoken languages are so broadly culturally recognized as communicative tools that their expressive nature is presumed to fall within the umbrella of the First Amendment. Other forms of expressive conduct must be examined more closely to determine whether, in a given social and cultural context, the activity has the potential to express an idea to others. Regardless of whether the expression takes the form of spoken language or a symbolic gesture, the inquiry remains the same: does the activity have the potential to communicate an idea, even if the idea is not readily discernible or even if communication is not specifically intended?28